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PLANETARY PHENOMENA FOR JANUARY AND FEBRUARY, 1896.

By Professor Malcolm McNeill.

January, 1896.

The Earth is in perihelion at about 10 A. M., P. S. T., January 1st.

Mercury is an evening star throughout the month, and comes to greatest eastern elongation at about midnight on January 23d. At this time it sets about an hour and a half later than the Sun, and from about January 12th to the end of the month it sets at least an hour later; so it is in good position for evening observation. The Moon passes south of *Mercury* on January 15th, the day after full moon, but the time of nearest approach does not occur until after both have set for all portions of the United States. The Moon will occult the planet in portions of the South Pacific Ocean.

Venus is still a morning star, rising from three and one-half to two and one-half hours before the Sun. During the month it comes a little nearer to the Sun, but their relative distance does not vary much. It moves rapidly eastward and a little southward through the constellations *Scorpio* and *Sagittarius*.

Mars is also a morning star, rising about two hours before the Sun. It is moving eastward in the constellation *Sagittarius*, and has begun to come nearer to us, although still distant from us more than twice the mean distance of the Earth from the Sun.

Jupiter is coming to good position for observation, rising before 7 P. M. on January 1st, and more than two hours earlier at the end of the month. It is in opposition on the morning of January 24th. It is moving westward (retrograding) in the constellation *Cancer*. At the beginning of the month it is about the Moon's diameter distant from the fourth magnitude star δ *Cancri*, and it moves about four degrees westward before the close of the month.

Saturn is still a morning star, but rises earlier than before. During the month it moves about two degrees eastward in the constellation *Libra*. The rings are wider open than during 1895, the minor axis being rather more than one-third of the major.

Uranus is a morning star, rising rather more than half an hour later than Saturn. It is moving eastward near the boundary of the constellations *Libra* and *Scorpio.*

Neptune is in the constellation *Taurus*, and is above the horizon until nearly sunrise.

EXPLANATION OF THE TABLES.

The phases of the Moon are given in Pacific Standard time. In the tables for Sun and planets, the second and third columns give the Right Ascension and Declination for Greenwich noon. The fifth column gives the local mean time for transit over the Greenwich meridian. To find the local mean time of transit for any other meridian, the time given in the table must be corrected by adding or subtracting the change per day, multiplied by the fraction whose numerator is the longitude from Greenwich in hours, and whose denominator is 24. This correction is seldom much more than 1^m. To find the standard time for the phenomenon, correct the local mean time by *adding* the difference between standard and local time if the place is west of the standard meridian, and *subtracting* if east. The same rules apply to the fourth and sixth columns, which give the local mean times of rising and setting for the meridian of Greenwich. They are roughly computed for Lat. 40°, with the noon Declination and time of meridian transit, and are intended as only a rough guide. They may be in error by a minute or two for the given latitude, and for latitudes differing much from 40° they may be several minutes out.

PHASES OF THE MOON, P. S. T.

		H. M.
Last Quarter,	Jan. 7,	7 25 A. M.
New Moon,	Jan. 14,	2 19 P. M.
First Quarter,	Jan. 22,	6 42 P. M.
Full Moon,	Jan. 30,	12 55 A. M.

THE SUN.

1896.	R. A. H. M.	Declination. ° ′	Rises. H. M.	Transits. H. M.	Sets. H. M.
Jan. 1.	18 46	— 23 2	7 24 A.M.	12 4 P.M.	4 44 P.M.
11.	19 30	— 21 50	7 23	12 8	4 53
21.	20 13	— 19 57	7 19	12 11	5 3
31.	20 55	— 17 26	7 12	12 14	5 16

MERCURY.

1896.	R. A. H. M.	Declination. ° ′	Rises. H. M.	Transits. H. M.	Sets. H. M.
Jan. 1.	19 17	− 24 23	8 1 A.M.	12 35 P.M.	5 9 P.M.
11.	20 27	− 21 8	8 19	1 5	5 51
21.	21 27	− 15 42	8 17	1 26	6 35
31.	21 50	− 11 2	7 44	1 9	6 34

VENUS.

Jan. 1.	15 39	− 16 49	3 53 A.M.	8 57 A.M.	2 1 P.M.
11.	16 27	− 19 20	4 10	9 5	2 0
21.	17 17	− 21 6	4 28	9 16	2 4
31.	18 9	− 21 57	4 44	9 28	2 12

MARS.

Jan. 1.	16 52	− 22 44	5 28 A.M.	10 9 A.M.	2 50 P.M.
11.	17 23	− 23 30	5 23	10 1	2 39
21.	17 55	− 23 52	5 18	9 54	2 30
31.	18 27	− 23 51	5 9	9 46	2 23

JUPITER.

Jan. 1.	8 38	+ 19 7	6 48 P.M.	1 58 A.M.	9 8 A.M.
11.	8 34	+ 19 27	6 2	1 13	8 24
21.	8 28	+ 19 47	5 16	12 29	7 42
31.	8 23	+ 20 7	4 26	11 40 P.M.	6 54

SATURN.

Jan. 1.	14 59	− 14 39	3 4 A.M.	8 17 A.M.	1 30 P.M.
11.	15 2	− 14 51	2 28	7 41	12 54
21.	15 5	− 15 0	1 53	7 4	12 15
31.	15 7	− 15 7	1 16	6 27	11 38 A.M.

URANUS.

Jan. 1.	15 23	− 18 16	3 41 A.M.	8 41 A.M.	1 41 P.M.
11.	15 25	− 18 23	3 4	8 3	1 2
21.	15 26	− 18 28	2 28	7 26	12 24
31.	15 27	− 18 33	1 49	6 47	11 45 A.M.

NEPTUNE.

1896.	R. A. H. M.	Declination. ° ′	Rises. H. M.	Transits. H. M.	Sets. H. M.
Jan. 1.	5 0	+21 15	2 57 P.M.	10 16 P.M.	5 35 A.M.
11.	4 59	+21 14	2 16	9 35	4 54
21.	4 58	+21 13	1 36	8 55	4 14
31.	4 57	+21 12	12 56	8 15	3 34

ECLIPSES OF *JUPITER'S* SATELLITES, P. S. T.

Before opposition, January 24th, the phenomena are to be seen near the left limb of the planet, a little below the line of the belts, as seen in an inverting telescope. After opposition, the eclipses occur near the right limb.

		H. M.			H. M.
II, D,	Jan. 1.	8 0 P. M.	I, D,	Jan. 15.	3 54 P. M.
I, D,	3.	6 35 A. M.	II, D,	16.	1 11 A. M.
IV, D,	3.	11 42 P. M.	I, D,	19.	4 51 A. M.
IV, R,	4.	4 7 A. M.	IV, D,	20.	5 42 P. M.
I, D,	5.	1 3 A. M.	I, D,	20.	11 20 P. M.
I, D,	6.	7 32 P. M.	III, D,	22.	4 15 A. M.
III, D,	7.	8 18 P. M.	I, D,	22.	5 48 P. M.
I, D,	8.	2 0 P. M.	II, R,	26.	7 55 P. M.
II, D,	8.	10 35 P. M.	I, R,	28.	3 30 A. M.
I, D,	12.	2 57 A. M.	I, R,	29.	9 58 P. M.
I, D,	13.	9 26 P. M.	I, R,	31.	4 27 P. M.
III, D,	15.	12 17 A. M.			

FEBRUARY, 1896.

Eclipses. There will be two during the month, and neither of them will be visible in the United States.

An annular eclipse of the Sun occurs on February 13th, visible mainly in regions near the south pole. The eclipse will be seen as partial on the east coast of South America and the west coast of South Africa.

A partial eclipse of the Moon on February 28th, visible in the eastern hemisphere. Its greatest magnitude is eighty-seven per cent. of the Moon's diameter.

Mercury is an evening star at the beginning of the month, but rapidly approaches the Sun, coming to inferior conjunction on February 8th. It then rapidly recedes from the Sun, and, by the end of the month, it is nearly at greatest western elongation as a morning star. It then rises a little more than an hour before sunrise, and may possibly be seen if the weather conditions are good.

Venus is still a morning star, but is drawing nearer the Sun and rising later. It moves through the constellation *Sagittarius* into *Capricorn*.

Mars is also a morning star, rising about two hours before the Sun. It is moving eastward in the same part of the heavens as *Venus*, the latter moving much more rapidly, and passing from a position about four degrees west on February 1st to a position about ten degrees east on February 29th. On February 9th, *Venus* passes one degree thirty-eight minutes north of *Mars*.

Jupiter rises before sunset on February 1st, and remains above the horizon practically the entire night. At the end of the month it sets at a little before 5 A. M. It retrogrades about three degrees in the constellation *Cancer*, and is a little west of the "Bee-hive" cluster.

Saturn, by the end of the month, rises shortly after 11 P. M. It moves a little eastward until February 26th, when it turns and begins to move westward in the eastern part of the constellation *Libra*.

Uranus follows after *Saturn*, rising just before midnight on February 29th. It is near the boundary line of *Libra* and *Scorpio*.

Neptune is nearly stationary in the eastern part of the constellation *Taurus*.

PHASES OF THE MOON, P. S. T.

		H. M.
Last Quarter,	Feb. 5,	4 38 P. M.
New Moon,	Feb. 13,	8 13 A. M.
First Quarter,	Feb. 21,	1 15 P. M.
Full Moon,	Feb. 28,	11 51 A. M.

THE SUN.

1896.	R. A. H. M.	Declination. ° ′	Rises. H. M.	Transits. H. M.	Sets. H. M.
Feb. 1.	20 59	− 17 9	7 11 A.M.	12 14 P.M.	5 17 P.M.
11.	21 39	− 14 5	6 59	12 14	5 29
21.	22 18	− 10 37	6 47	12 14	5 41
Mar. 2.	22 55	− 6 53	6 33	12 12	5 51

MERCURY.

1896.	R. A.	Declination.	Rises.	Transits.	Sets.
	H. M.	° ′	H. M.	H. M.	H. M.
Feb. 1.	21 49	− 10 51	7 37 A.M.	1 4 P.M.	6 31 P.M.
11.	21 11	− 12 26	6 26	11 47 A.M.	5 8
21.	20 50	− 15 34	5 37	10 46	3 55
Mar. 2.	21 11	− 16 11	5 22	10 28	3 34

VENUS.

Feb. 1.	18 14	− 21 59	4 45 A.M.	9 29 A.M.	2 13 P.M.
11.	19 6	− 21 42	4 59	9 42	2 25
21.	19 58	− 20 22	5 4	9 54	2 44
Mar. 2.	20 48	− 18 3	5 5	10 5	3 5

MARS.

Feb. 1.	18 30	− 23 49	5 9 A.M.	9 46 A.M.	2 23 P.M.
11.	19 3	− 23 21	5 0	9 39	2 18
21.	19 35	− 22 28	4 49	9 31	2 13
Mar. 2.	20 7	− 21 12	4 37	9 24	2 11

JUPITER.

Feb. 1.	8 22	+ 20 9	4 21 P.M.	11 35 P.M.	6 49 A.M.
11.	8 17	+ 20 27	3 36	10 51	6 6
21.	8 12	+ 20 42	2 50	10 7	5 24
Mar. 2.	8 9	+ 20 53	2 07	9 24	4 41

SATURN.

Feb. 1.	15 7	− 15 7	1 12 A.M.	6 23 A.M.	11 34 A.M.
11.	15 8	− 15 11	12 35	5 45	10 55
21.	15 9	− 15 12	11 57 P.M.	5 7	10 17
Mar. 2.	15 9	− 15 10	11 17	4 27	9 37

URANUS.

Feb. 1.	15 28	− 18 33	1 46 A.M.	6 44 A.M.	11 42 A.M.
11.	15 28	− 18 36	1 7	6 5	11 3
21.	15 29	− 18 37	12 29	5 26	10 23
Mar. 2.	15 29	− 18 37	11 50 P.M.	4 47	9 44

NEPTUNE.

1896.	R. A. H. M.	Declination. ° ′	Rises. H. M.	Transits. H. M.	Sets. H. M.
Feb. 1.	4 57	+21 12	12 52 P.M.	8 11 P.M.	3 30 A.M.
11.	4 57	+21 12	12 12	7 31	2 50
21.	4 57	+21 12	11 33 A.M.	6 52	2 11
Mar. 2.	4 57	+21 13	10 54	6 13	1 32

ECLIPSES OF *JUPITER'S* SATELLITES, P. S. T.

The eclipses are to be seen near the right limb of the planet, a little below the line of the belts, as seen in an inverting telescope.

		H. M.			H. M.
II, R,	Feb. 2.	10 30 P. M.	I, R,	Feb. 16.	2 45 P. M.
I, R,	4.	5 24 A. M.	II, R,	17.	3 41 A. M.
III, R,	5.	3 42 P. M.	III, R,	19.	11 42 P. M.
I, R,	5.	11 53 P. M.	I, R,	20.	3 42 A. M.
IV, R,	6.	4 17 P. M.	II, R,	20.	4 59 P. M.
I, R,	7.	6 21 P. M.	I, R,	21.	10 11 P. M.
II, R,	10.	1 6 A. M.	I, R,	23.	4 40 P. M.
III, R,	12.	7 42 P. M.	III, R,	27.	3 42 A. M.
I, R,	13.	1 47 A. M.	II, R,	27.	7 34 P. M.
I, R,	14.	8 16 P. M.	I, R,	29.	12 6 A. M.

HELIUM, ASTRONOMICALLY CONSIDERED.

By EDWIN B. FROST.

Scientific discoveries seldom come singly. The mastering of one problem of nature commonly suggests new modes of attacking other problems, and often contains in itself the key to their solution. Perhaps it is quite as frequently the case that new discoveries follow incidentally, it may be, in the researches for completing the original discovery, or in the revived interest in subjects previously supposed to be exhausted for research with known methods.

So it was that the brilliant discovery in 1894, by LORD RAYLEIGH and Professor RAMSAY of the gaseous element, argon, after very long and painstaking researches, led incidentally to the detection of terrestrial helium by the latter of these distinguished investigators—a discovery of far more astronomical importance